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PRECA – PREPAREDNESS AND RESPONSE FOR MASS GATHERINGS AND OTHER HEALTH THREATS IN CENTRAL ASIA

PUBLIC HEALTH MANAGEMENT OF CHEMICAL INCIDENT RESPONSE AND THE ROLE OF POISONS INFORMATION CENTRES IN MASS GATHERING EVENTS IN CENTRAL ASIA

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AUTHORS

EU:

- Raquel Duarte-Davidson
  Chemical Safety and Security Expert

Kazakhstan:

- Jambul Jabayev
  Committee on Civil Defence and Military Units, Ministry of Emergency of Kazakhstan
- Gulmira Toibayeva
  Toxicology Department, Almaty Emergency Hospital

Kyrgyzstan:

- Ali Khalmurzaev
  Ministry of Natural Resources, Ecology and Technical Supervision of the Kyrgyz Republic
- Elina Iudakova
  Ministry of Natural Resources, Ecology and Technical Supervision of the Kyrgyz Republic

Mongolia:

- Ulzisaikhan Tumurbaatar
  National Emergency Center of Mongolia
- Sonormaa Jigmedgotov and Naranchimeg Bagdai
  PRECA Coordinators in Mongolia

Pakistan:

- Syeda Shazia Adeel,
  National Institute of Health
- Faheem Tahir
  National Institute of Health

Tajikistan:

- Nodira Khakimova
  Chemical, Biological, Radiological and Nuclear Safety and Security Agency
- Elmurod Pulatov
  Chemical, Biological, Radiological and Nuclear Safety and Security Agency

Uzbekistan:

- Khojiev Khusniddin
  Republican Scientific Center for Emergency Medical Aid
- Amir Stopnitsky
  Republican Scientific Center for Emergency Medical Aid

PURPOSE AND SCOPE

Large chemical incidents at mass gatherings are very rare, but when a chemical is released accidental or deliberately during a mass gathering, the consequences and impacts on human health can be catastrophic and can lead to front line response, including hospital capacity to deal with casualties, being overwhelmed, all of which highlights the importance of having plans in place and being prepared to respond to such eventualities.

Key to be prepared for dealing with a large incident at a mass gathering event is to have systems in place to respond to chemical incidents more generally at the local, regional, and national level. Undertaking exercises (e.g., tabletop exercises) to run through potential scenarios (e.g., a chemical release during a football match) on a regular basis is essential for training purposes but also to ensure there are up to date planning, preparedness and response mechanisms in place. These may be different approaches between countries and there may be regional systems in place for helping neighbouring countries during large incidents that overwhelm national capacity and having a mechanism in place to deal with cross border health threats is important.

Generic guidelines on the different steps and aspects that need to be considered for dealing with a chemical incident are already available, both in the context of mass gatherings but also for chemical incidents in general to include both accidental and deliberate releases (e.g., chemical releases from industrial sites to the wider environment and the local population or during transport or chemical contamination of food and consumer products leading to covert releases and exposure in the population). Whilst chemical events are more likely to be overt (e.g., a fire, a chemical plume or an explosion), they can also be covert in nature (e.g., chemical adulteration of food) and of unknown aetiology in the early stages as exposed individuals present to hospital with signs and symptoms which could be attributed to an infectious disease in the first instance. Hence it is important to be prepared to deal with both scenarios for which different approaches are required.

This document is directed at competent authorities involved with chemical incident response and health professionals charged with providing clinical advice to manage patients exposure to chemicals during mass gathering and other events, i.e. poisons information centres (PICs) and for countries that do not have well established PICs, clinical toxicologists and other health professionals who would be involved in the provision of this advice (e.g., poisons information specialists, nurses, paramedics, public health professionals, etc.). As much is already publicly available, information in this document aims to highlight main areas that need to be considered, making reference to key publications, all of which are essential reading as a first step to becoming familiar with chemical incident planning, preparedness, response and recovery. Information must always be interpreted alongside national documents where available, as these will provide a more accurate structure and approaches used nationally.

For managing chemical incidents at mass gathering events, it is important to have an overview of how chemical incidents are managed from a public health perspective, including assessing the risks through undertaking a dynamic risk assessment, considering the risk management options,

communication and surveillance. Poisons centres have an important role in detection and response to chemical incidents and it is important to understand the role they play.

The following references are essential background material that provides guidance on the key aspects that need to be considered in dealing with chemical incidents at mass gathering:

- Public Health for mass gatherings: key considerations (WHO, 2015a)
- International Health Regulations (2005) Third Edition (WHO, 2016)
- International Health Regulations and chemical events (WHO, 2015b)
- The Strategic Approach to International Chemicals Management (SAICM)
- Manual for the public health management of chemical incidents (WHO, 2009)
- Human health risk assessment toolkit: chemical hazards (WHO, 2021a)
- Rapid risk assessment of acute public health events (WHO, 2012)
- Guidelines for establishing a poisons centre (WHO, 2021b)
- At least one poison centre in each country: summary for policy Makers (WHO, 2023a)
- Poison centres as essential unit for poisoning prevention and sound chemicals management: technical summary (WHO, 2023b)
- Manual for investigating suspected outbreaks of illnesses of possible chemical aetiology (WHO, 2021c)

These guidelines, which draw heavily from the references highlighted above, cover the following:

1. Relevant international initiatives
2. Public health chemical incident response in the context of mass gatherings
3. Public health management of chemical incidents
4. The role of poisons information centres in dealing with chemical incidents
5. Suspected outbreaks of illness of possible chemical aetiology

1. RELEVANT INTERNATIONAL INITIATIVES

A number of important international initiatives have recently been undertaken that require countries to strengthen capacities in relation to the health aspects of chemical incidents and emergencies.

In 2005, the revised International Health Regulations were adopted by the World Health Assembly. Entering into force in 2007, IHR (2005) is a legally binding agreement contributing to international public health security by providing a framework for the coordination of the management of events that may constitute a public health emergency of international concern, and for strengthening the capacity of all countries to detect, assess, notify and respond to public health threats. Initially developed for certain infectious diseases, the revised IHR (2005) now also covers those public health threats involving chemical (WHO, 2015) and radiological hazards.

The implementation of chemical-related national and international laws, agreements and approaches in countries is the responsibility of a number of sectors, including environment, labour, agriculture, health, civil protection, transport and customs. However, many of the capacities needed to implement these laws and agreements are relevant to the preparedness, prevention and response to public health events and emergencies under the IHR, e.g., capacities for chemical risk assessment and for chemical event response. It is therefore important for health authorities to reach out to, and collaborate with, the authorities that are responsible for chemical control laws when identifying or establishing the core capacities for chemical events under the IHR.

The concept of building and strengthening capacities common to different, but related, instruments and sets of legislation is also central to IHR implementation. Annex 1 of the Regulations, for example, requests countries to utilize existing structures to meet their core capacity requirements, including those outside the health sector. In addition, Article 14 requests WHO to cooperate and coordinate its activities with other competent organizations and international bodies in the implementation of the Regulations, including those that have a role in the management of chemical events (e.g., some of the Participating Organizations of the Inter-Organization Programme for the Sound Management of Chemicals (IOMC, 2015a) and the Environmental Emergencies Section of the Joint UNEP/OCHA (United Nations Environment Programme and Office for the Coordination of Humanitarian Affairs) Environment Unit (UNEP/OCHA, 2015).

Many countries have laws and regulations governing chemical production and use. In addition, many countries have signed international agreements (e.g. Basel, Rotterdam, Stockholm and Minamata Conventions) aimed at controlling the use, trade, movement and disposal of certain chemicals. In 2006, the Strategic Approach for International Chemicals Management (SAICM) was adopted by the International Conference on Chemicals Management. SAICM is a voluntary initiative to help countries manage chemicals within their borders to reduce the harmful impacts of chemicals on human health and the environment. SAICM provides a policy framework to promote chemical safety around the world, including many aspects of chemical incident prevention and preparedness.

WHO (2015b) provides information about building IHR (2005) core capacities for chemical events in order to assist National IHR Focal Points (NFPs) to identify national institutions having a role in the management of chemicals. This document also aims to raise awareness about the IHR (2005) in professionals who have a role in the management of chemicals under various regulatory contexts but who are not familiar with the IHR (2005); and (iv) to provide information to facilitate an inter-ministerial approach for the management of chemical events, including building synergies in the implementation of relevant international agreements.

2. PUBLIC HEALTH CHEMICAL INCIDENT RESPONSE IN THE CONTEXT OF MASS GATHERINGS

Mass gatherings (MGs) are characterized by the concentration of people at specific locations for a specific purpose over a set period of time. Decisions to host such events are planned well in advance of the event and involve planning and preparation to ensure that public health systems and services are addressing public health prevention and response. It involves undertaking risk assessments in advance to identify potential public health risks and have systems in place to prevent, minimize and respond to public health emergencies.

MGs can place a strain on the local health care system, even when systems are in place to deal with incidents and emergencies, and mechanisms need to be in place to strengthen existing services and introduce new or enhanced methods for managing disease and other public health risks. Preparation for such events follow an all-hazards approach that covers chemical, biological and radionuclear (CBRN) incidents. Specialists from the different fields, including chemicals need to be involved at all stages to ensure they are familiar with the overall process (see C3 guidance for further detail) as well as with the approaches and procedures specific to their specialist role in responding to a chemical incident at a MG.

Overarching systems should be in place in advance of the MG and key considerations include:

- Conducting a risk assessment to prioritise and plan the capacity to deal with a chemical incident during the MG, taking into account resources and budget available.
- Build on existing preparedness and response systems; if no system exists, a risk assessment of the chemical risk should be undertaken.
- Ensure collaboration and coordination as any chemical event at a MG will demand a significant response from the public health sectors but this contribution is often not recognised in the initial planning unless public health is involved.
- Surveillance systems need to be adequately sensitive to detect and identify the chemical agent and its effects as early as possible to implement a rapid and effective response.
- A strong command, control and communication structure needs to be in place to deal with the public health response and this should be understood by all stakeholders, including the chemical specialists involved in the response.

Chemical specialists should be involved in the planning and preparedness process to ensure that the systems in place will be able to deal with an accidental or deliberate release of chemicals at MGs and clear guidelines and SOPs should be available to address chemical incidents and bring specialists to the response function when required. Chemical specialists also play a key role in surveillance and in providing clinical management advice for potentially exposed individuals during the incident, through the poisons information centre services (if available in the country) and through the countries' public health response teams. Further details are provided in WHO's 'Public Health for Mass Gatherings: Key Considerations'; this document has a specific section on chemicals.

3. PUBLIC HEALTH MANAGEMENT OF CHEMICAL INCIDENTS

The production and use of chemicals are increasing worldwide. According to UNEP (2019) the production capacity of the global chemical industry almost doubled between 2000 and 2017, from about 1.2 to 2.3 billion tonnes and production of chemicals is projected to continue growing rapidly in emerging economies. WHO (2019) has estimated that 24% of global deaths are due to modifiable environmental factors, including exposure to toxic chemicals. The estimated burden of disease attributable to chemicals (from a limited selection of chemicals where sufficient data are available and hence an underestimate of the total) was 1.6 million lives and 45 million disability-adjusted life years lost based on 2016 data. Unintentional poisonings kill an estimated 78,000 people per year, in particular children and young adults (The public health impact of chemicals: knowns and unknowns – data addendum for 2016, WHO 2018).

Despite the omnipresence of chemicals worldwide and their predicted increase in production and use, many countries lack adequate capacities to deal with the health aspects of chemical events and emergencies (WHO, 2015b). Even where these exist, crisis situations may occur, overwhelming national response capacities and requiring international assistance to be provided.

The management of chemical incidents and emergencies requires a multi-disciplinary and multi-sectoral approach and public health plays an important role at various stages of the management process. The WHO has published a comprehensive overview for public health and environmental professionals of the principles and roles of public health in the management of chemical incidents and emergencies (WHO, 2009). The Manual provides information on the principles and roles of public health in the management of chemical incidents and emergencies, including prevention and preparedness, detection and alert, response and recovery as well as crisis communication. It also highlights the essential role that public health has to play in preventing the occurrence of chemical incidents and minimizing their negative impacts on both the exposed population and the environment. For the more, it is advisable to have an onsite specialist to make informed decisions regarding appropriate triage (i.e. the assessment of the clinical condition of exposed individuals with designations of priorities for decontamination, treatment and transportation to hospital). Guidance on triage is widely available and examples include documents published by international organisations (e.g., WHO 2014), government documents (e.g. NHS, 2020 or PHE, 2018) as well as academic publications (e.g. Ramesh and Kumar, 2010). The WHO (2009) manual is currently being updated and the second edition should be available later in 2024.

3.1 CHEMICAL RISK ASSESSMENT

Risk assessment aims to estimate, qualitative or quantitatively, the likelihood of harm associated with exposure to a chemical substance (WHO, 2021a). The assessment of human health risk requires identification, compilation and integration of information on the health hazards and human exposure to the chemical, and the relationships between exposure, dose and adverse effects. The information obtained from the risk assessment process will be used by policy makers to put measures in place to manage the risks (risk management) and communicate the risks to the affected population (risk communication).

The WHO has developed a toolkit (WHO, 2021a) to help people make decisions about chemicals by assessing the magnitude of potential risks to human health associated with exposure to the chemicals to (a) help identify and acquire the information needed to assess chemical hazards, exposures and risks; and (b) use that information to estimate potential exposure to hazardous chemicals and the corresponding health risks.

This toolkit can be used to address a wide range of situations that are relevant to the management of risks for public health, including the assessment of the risks assessments of chemical incidents. The toolkit can assist with performance of a risk assessment by:

- providing generic roadmaps for conducting chemical risk assessments for the different steps of the risk assessment (i.e. hazard identification and characterisation, exposure assessment and risk characterisation)
- identifying information that must be gathered to complete a risk assessment
- Providing references, including internet URLs, for international resources from which an assessor can obtain information and methods essential to a risk assessment.

Whilst the toolkit is generic in nature, the fundamental principles and steps highlighted within the document are applicable to those required to undertake a rapid risk assessment during a chemical incident and as such this document will provide a valuable reference source. It is important to be very familiar with the process highlighted in the toolkit to be able apply these principles to assessing the risks during a chemical event.

3.2 RAPID RISK ASSESSMENT

Risk assessment plays a crucial role in managing chemical incidents such as accidental industrial releases, accidental or deliberate chemical incidents at a mass gathering event, natural events or deliberate mass poisonings. The risk assessment component of this type of incident is necessarily conducted over a very short period of time (usually hours), referred to as rapid risk assessment. In addition to the tookit described above (section 2), WHO guidance is available on rapid risk assessment of acute public health risks from all types of hazards, including multisectoral links in these types of incidents (WHO, 2012). The key steps of a rapid risk assessment are the same as those included in the toolkit, namely problem formulation, hazard identification, hazard characterization, exposure assessment and risk characterization. Many of the resources mentioned in the Toolkit can be consulted for a rapid risk assessment, along with:

- Predictive exposure modelling tools such as the Areal Locations of Hazardous Atmospheres (ALOHA®), a programme designed by the United States EPA specifically for use in responding to chemical releases that result in toxic gas dispersions, fires, and explosions. In addition, modelling and predictions may be provided from in country HAZMAT teams.
- Specific information on the public health impacts of specific chemicals that can be accessed during an incident, a good example here would be UKHSA's Chemical Compendia; whilst it is not possible to have information on all chemicals sites such as this example provide information on the most common chemicals released during chemical incidents.
- Acute Exposure Guideline levels such as AEGLs which are often used to assess the risks of incidents involving high peak exposures during short periods of time. AEGLs are calculated for five relatively short exposure periods (10 minutes, 30 minutes, 1 hour, 4 hours, and 8 hours) as differentiated from air standards based on longer or repeated exposures. AEGL "levels" are dictated by the severity of the toxic effects caused by the exposure, with Level 1 being the least and Level 3 being the most severe.

4. THE ROLE OF POISONS INFORMATION CENTRES IN DEALING WITH CHEMICAL INCIDENTS

A poison information centre is a specialized unit that provides advice and assists in the prevention, diagnosis and management of acute and chronic poisoning. Poison centres contribute to reducing the burden of diseases related to exposure to hazardous chemical agents in emergencies and in everyday life. A number of documents are available that provide an overview of the functions of poisons centres as well as guidance on how to set up a poisons centre (WHO 2021b, 2023a, 2023b).

These publications summarizes key information on poison centres: their role in management of poisonings, public health preparedness and response to emergency situations and implementation of International Health Regulations and contribution to sound chemicals management. In the context of chemical incident response, poisons information centres main functions include:

- management of chemical poisonings – including prevention, detection, diagnosis and treatment
- public health detection and management of chemical incidents and non-chemical emergencies including IHR implementation

A poison information centre plays a pivotal role in management of chemical incidents and mass poisonings and for fully functional poisons information centres, this will include having surveillance in place for intoxication and poisonings (WHO, 2023a). The core capacities needed for chemical events can be grouped into four strategic areas: policy coordination and communication; event detection, verification and risk assessment; preparedness and emergency response; and capacity-building (WHO, 2015b).

Poison centres contribute to all stages of disaster management including (WHO, 2023b):

- To aid prevention by sharing information, undertake assessments and map risks to detect new trends in poisonings and chemicals, providing awareness raising and education, and sharing information with the public and professionals.
- To boost preparedness, by contributing to strategic planning of responses to emergencies, including development of standard operating procedures and treatment protocols; tracking of antidotes; education and training; and inventory tracking of essential medicines, personal protective equipment (PPE) and decontamination protocols.
- To support detection and alerts, by offering a 24/7 telephone service, ensuring access to toxicological laboratories and issuing real-time alerts and responses; and support early warning systems, toxicovigilance, toxicosurveillance and communication.
- To facilitate response, by contributing to rapid risk assessment, providing toxicological information, ensuring antidote provision, and offering advice on triage, secondary contamination and PPE.

- To assist recovery, by identify affected people, support follow-up epidemiological studies, evaluating risks, restock medicines to ensure availability of antidotes and revise treatment protocols, if required.

Poisons centres specialists play a key role in the detection, identification and alerting of hazardous poisonings in real time (toxicovigilance). Once a signal is detected, it forms the basis of a rapid risk assessment. Toxicovigilance is the capacity to identify new emerging substances that may be of concern to public health. An established toxicovigilance system can create an alert about an increase in poisonings and chemical emergencies in real time and include timely dissemination of public health information for assessment and public health response as necessary. This is usually in the form of an early warning system for detecting and identifying the hazard and a central alerting system. Within a country, a poison centre is uniquely placed to link many government agencies, such as food safety and crime agencies, health and safety executives, departments for patient safety and ministries of agriculture, climate and public health.

Toxicosurveillance on the other hand refers to the systematic ongoing collection and analysis of data for public health purposes. Toxicosurveillance provides an invaluable source of public health data. Surveillance outputs can inform the development of policy and legislation, and prospectively demonstrate the effectiveness of legislation. Surveillance is used to monitor case data on substances of interest, usually substances that are already a known concern to public health, such as carbon monoxide or pesticides.

5. SUSPECTED OUTBREAKS OF ILLNESS OF POSSIBLE CHEMICAL AETIOLOGY

The causes of many chemical incidents are obvious (e.g., an explosion, fire or leak resulting in the release of an airborne plume or tainting and polluting water) and some incidents can have international consequences, for example when a chemical release contaminates an environmental medium such as air or water and subsequently traverses national borders. Occasionally, however, a chemical release may not be obvious, and the possibility considered only when a number of cases present or are reported (WHO, 2021c) Timely identification of the cause requires detection and verification of clusters and a subsequent outbreak investigation. The investigations may require a detailed study with epidemiological, environmental, clinical and toxicological approaches. As the number of candidate chemicals may be vast, it may be very difficult to link an exposure to the presenting signs and symptoms.

The potential impact of such exposures may be significant and may require reporting to WHO in accordance with the IHR (2005) requirements, especially if the events are unusual, have serious public health consequences or potential for international spread and/or may result in restrictions on international travel or trade. Based on the information provided by Member States, WHO may declare such events as constituting a public health emergency of international concern. To meet their obligations, Member States must establish and maintain structures and systems for disease surveillance and outbreak response for all hazards. While the majority of such events are likely to concern infectious disease outbreaks, some may concern clusters or outbreaks in which the cause of disease is unknown or suspected to be chemical (WHO, 2021c). Whilst such covert incidents are rate at mass gatherings, if a cluster is confirmed at such an event as being an outbreak and it is apparent that it is non-infectious, it may be difficult to establish the cause. Extensive investigation may be required to determine whether the outbreak is due to exposure to an environmental hazard, such as a chemical substance, radiation, the physical environment or food or water contamination or adulteration. In some instances, a psychological aetiology may be suspected or plausible, referred to as “mass psychogenic illness”.

The WHO manual for investigating suspected outbreaks of illnesses of possible chemical aetiology (WHO, 2021c) describes in detail methods for investigating clusters or outbreaks that may be of chemical origin and describes the importance of a structured, coordinated, collaborative multidisciplinary, multi-agency approach at local, regional, national and international levels.

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WHO (2021b) for establishing a poisons centre (WHO, 2021b)

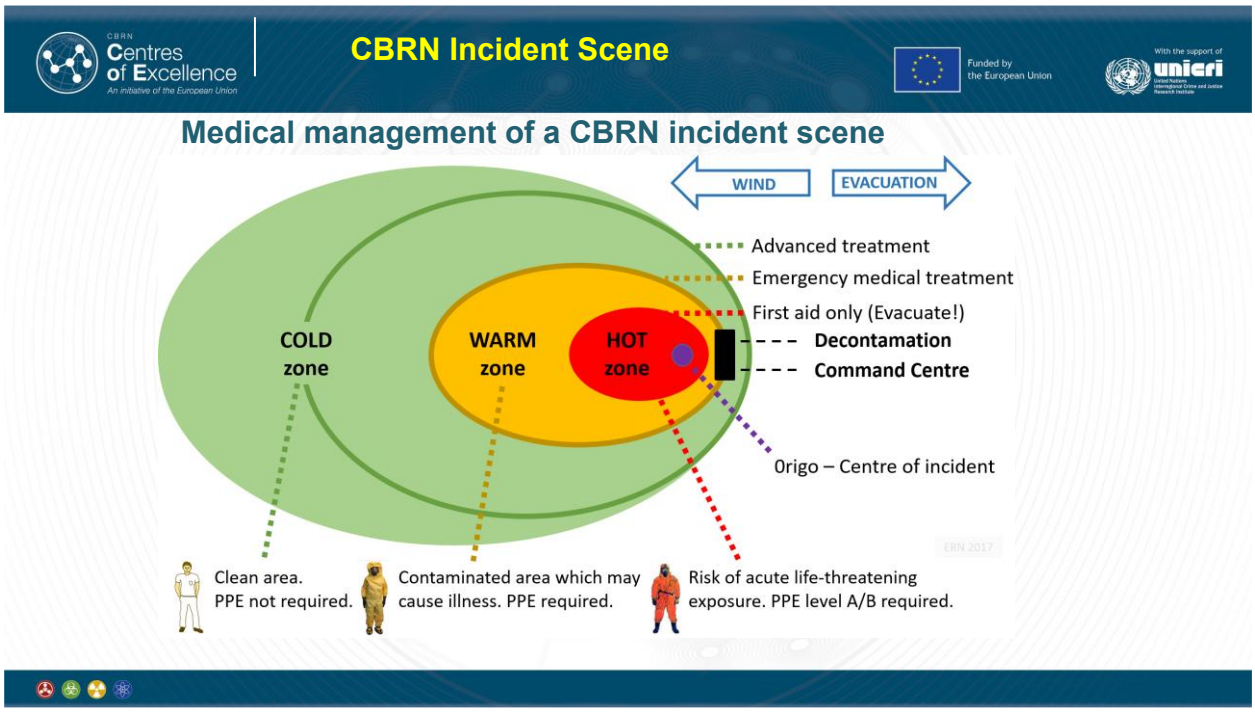
WHO (2021c) Manual for investigating suspected outbreaks of illnesses of possible chemical aetiology (WHO, 2021c)

WHO (2023a) At least one poison centre in each country: summary for policy Makers (WHO, 2023a)

WHO (2023b) Poison centres as essential unit for poisoning prevention and sound chemicals management: technical summary (WHO, 2023b)

7. ANNEX – ADDITIONAL INFORMATION

Triage diagram (hot/warm and cold zones)



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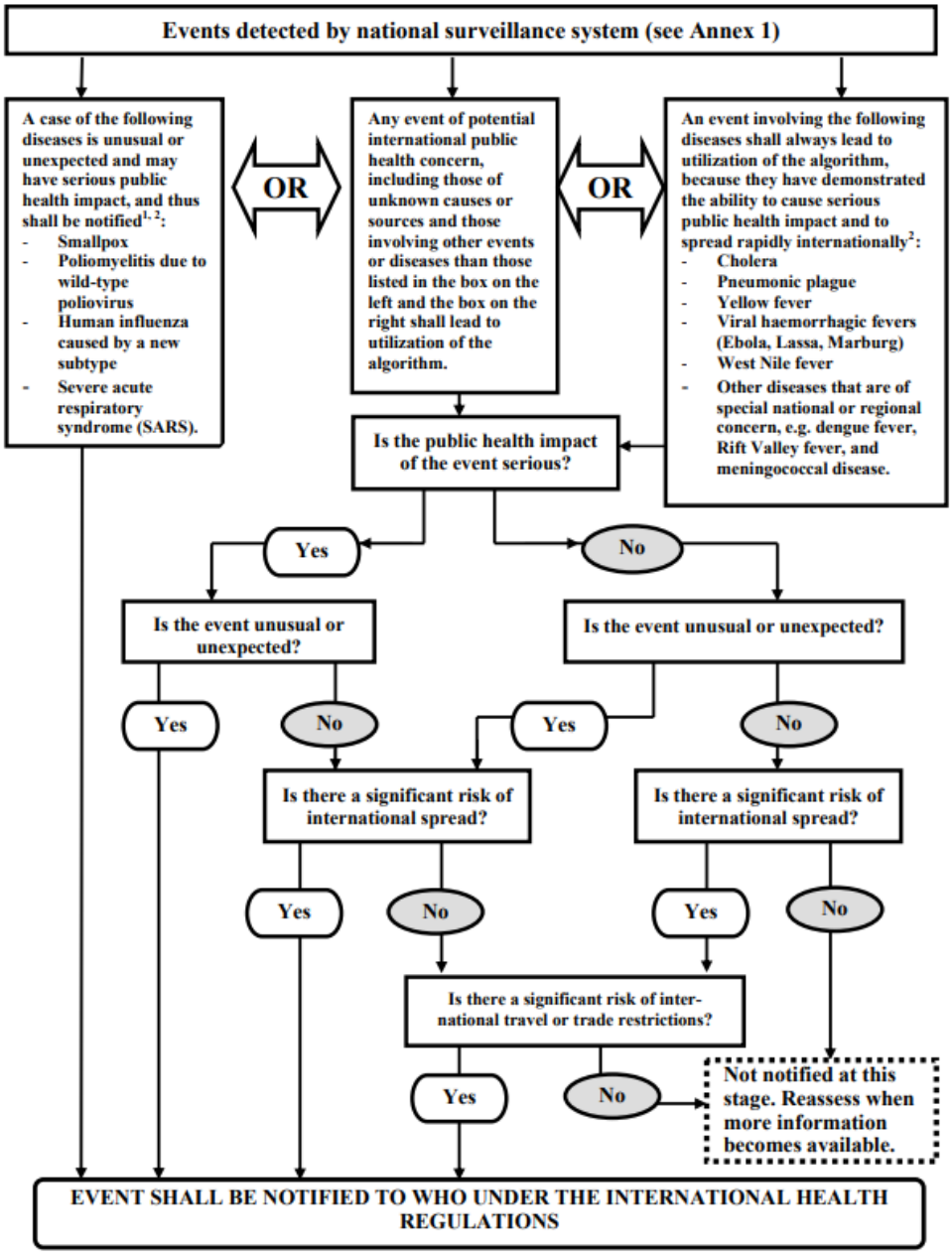

[1] As per WHO case definitions.
[2] The disease list shall be used only for the purposes of these Regulations.